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CURRENT ACTIVITIES

QUEBEC

On an Infestation of the Red-Headed Jack Pine Sawfly, Neodiprion virginianus Complex in Quebec.—The special survey conducted in Quebec in recent years in relation to a long-lasting infestation of the Swaine jack pine sawfly, *Neodiprion swainei* Midd. contributed to the detection of a light infestation of another species of sawfly also affecting jack pine, *Neodiprion virginianus* complex. This infestation was first recorded in the fall of 1957 in a small stand of pure jack pine, near St. Hilarion, Charlevoix County, 70 miles east of Quebec City. Defoliation varied from light to moderate but the presence of a few trees with approximately two feet of bare top led to the conclusion that the insect had already been present in the area for some years.

The discovery of this infestation led to surveys of the surrounding jack pine areas with the result that the insect was found in a few other localities but generally in smaller numbers. However, conditions similar to those recorded at St. Hilarion were found near St. Urbain, 10 miles north. An investigation of this stand showed that 51 per cent of the trees were affected. Defoliation was light on 10 per cent of the trees and moderate on the remaining 41 per cent. This report records the infestation and summarizes occasional observations made on the biology of the insect in these areas in 1957 and 1958.

The life cycle of the red-headed jack pine sawfly starts with the appearance of the adult in late spring or early summer. A few days later, the female lays its eggs in the jack pine needles, which are later consumed by the larvae. The larva is gregarious during its early instars but it becomes solitary as it matures later in the summer. The insect then drops to the soil to spin its cocoon for hibernation. In 1958, females were observed laying eggs in St. Urbain July 8 and 9, but egg laying must have begun before then as a total of 26 egg colonies were found on the trees at that time. No other observations could be made on adults during subsequent visits to the area on July 15 and later. At the time oviposition was observed, the new jack pine foliage was approximately half grown but eggs were not found on the new needles. The eggs are generally all grouped in one cluster on a few needles of the preceding year and laid like beads in the cuticle of the leaf. Egg counts made on 26 tagged colonies gave an average of 92 eggs per colony; the maximum number recorded was 138, the minimum 24. The number of eggs per needle varied from one to ten with an average of six.

Hatching from the egg was first noted on July 21 and last recorded on July 30; however, a high proportion of the eggs were still unhatched at that time. Part of the needles bearing unhatched eggs were still on the trees although they had turned brown while others had already fallen to the ground. These conditions were not observed on the five egg colonies laid on caged trees near the laboratory. The incubation period on caged eggs lasted from 20 to 30 days and periods varying from 26 to 29 days elapsed from the hatching of the first larva to the first spinning of cocoons

When resting, the young larvae generally group themselves on the twig near the egg cluster from where they spread out to feed. They usually prefer the old foliage but as they grow older they occasionally feed on the new foliage. When full grown, the larvae drop to the ground and spin cocoons in the top layer of the forest litter. The cocoons can generally be grouped in two size categories, the smaller ones usually producing male sawflies. A sex ratio of one male to 2.7 females was obtained from a total of 693 adults reared in 1957. Only males were obtained from eggs laid by unmated females.

Field observations made in 1958, also provided data on the importance of some natural control factors. It has already been mentioned that only some of the eggs hatched in 1958. Preliminary observations indicated that only 50 per cent of the 26 egg colonies observed produced larvae and that the maximum eclosion per individual colony was approximately 30 per cent. In addition, a reduction of the population was observed during larval development. When larval counts were made on a number of colonies, it was found one week later that the number of larvae had noticeably decreased. On August 11, approximately 21 days after the first larval emergence, when most larvae were in the third and fourth instars, a maximum of 11 larvae were found per colony. This is far from the original egg count mentioned above. All colonies still active at that time were then brought to the laboratory for the rearing.

The data obtained from the rearing of mature larvae collected in the field during the last two years show the degree of larval parasitism. Out of 1,660 cocoons spun in the laboratory in 1957, 37 per cent gave adult parasites and although the records for 1958 are not yet complete, larval parasitism will probably be as high as in 1957. Six species have been identified to date; they are, Diptera: *Diplostichus hamatus* A and W., *Spathimeigenia* sp. Hymenoptera: *Lamachus* sp.. *Euceros* sp., *Olesicampe lophyri* (Riley) and *Perilampus hyalinus* Say. Of these species, the first and last were the most abundant. The infestation will be followed again in 1959 but because of the great importance of natural control factors, no immediate increase is expected in the two localities where the insect has been recently abundant.—René Martineau.

An Effect of Soil-Packing in Densely Crowded Coniferous Seedlings.—An unusual disease associated with packing of soil around the base of 1-0 and 2-0 red pine (*Pinus resinosa* Ait.) and white spruce (*Picea glauca* (Moench) Voss) seedlings was observed in the late summer of 1958 and again during the summer of 1959 in a nursery at Drummondville, Que. This condition appears to be similar to that described by Davis for longleaf pine seedlings in the southeastern United States where killing occurred following injury by "sand splash" or "sand-silt-drift" (Davis, W. C. Damping-off of Longleaf Pine. Phytopathology 31:1011-1016, 1941).

In the Drummondville nursery, the disease was prevalent in patches where seedlings occurred in dense rows and where surface soil transported by wind and water had packed firmly around the stems and leaves of the plants. Where seedlings were less dense and the adhering soil was better aerated, no abnormality was observed. In the affected seedlings, the apical buds and primary leaves were necrotic and fungus mycelium was frequently observed in the aerial portions of the plants above the soil-pack. Often these parts had fallen from the plants. In some cases, the entire upper portion of the seedling was necrotic but the lower stem and root system were generally well developed and free from disease. The absence of root or stem disease was confirmed when affected seedlings removed from the nursery recovered by adventitious budding in the greenhouse.

The killing of the seedlings has been attributed to one or more of the facultative soil fungi. *Rhizoctonia solani*, *Fusarium* sp., and several unidentified soil fungi have been isolated from the diseased tissues and from the soil packed around the affected seedlings.

The development of the disease appears to be associated with relatively moist soil packed around the aerial portions of crowded plants and especially with the occurrence of soil-borne parasites in close proximity to susceptible host tissues.

It is thought that overcrowding of seedlings together with wind and water transport of the surface soil is mainly responsible for the soil packing and disease condition in this nursery.—H. S. Whitney.

ONTARIO

A Species of Pristiphora on Spruce in Ontario.—In 1958 and 1959 sawfly larvae of the genus *Pristiphora* were collected by the Forest Insect Survey on spruce in the Boreal Forest Region of Ontario. Adults reared from 1958 material have been

tentatively identified as *Pristiphora* near *lena* Kincaid, by Mr. H. R. Wong of the Forest Biology Laboratory, Winnipeg, Manitoba.

The larvae are somewhat similar to the yellow-headed spruce sawfly, *Pikonema alaskensis* (Roh.), in coloration, feeding habits, and seasonal occurrence, and have obviously been confused with it in the past. The larvae of the two species can be separated as follows:

Pristiphora near *lena*—Midventral eversible glands present on abdominal segments; a pair of reduced prolegs on abdominal segment 8; body dull olive green; dorsal line narrow, dark, sometimes indistinctly paired; subdorsal line wide, dark; no dark subspiracular line. Head black in early stages, yellowish in late stages. Full-grown larva about 10 mm. long.

Pikonema alaskensis—Midventral eversible glands absent; no prolegs on abdominal segment 8; body grey-green or olive green, waxy; paired dorsal lines narrow, dark; subdorsal and subspiracular lines dark. Head yellow to orange-red or black. Full-grown larva about 20 mm. long.

In the field the larvae of the two species can be distinguished by the dark subspiracular line and the waxy appearance of *P. alaskensis*, compared with the absence of a dark subspiracular line and the dull appearance of *Pristiphora* near *lena*. Both species prefer the current year's foliage. The *Pristiphora* sp. larvae have been collected in late June through July, whereas *P. alaskensis* may be found from late June through to early September.—O. H. Lindquist.

An Ambrosia Beetle, Corthylus punctatissimus Zimm., Attacking Maple Regeneration.—This beetle occurs generally in the eastern United States and although there are no published records of its occurrence in Canada, several specimens of the beetle or samples of its work were received in Forest Insect Survey collections from 1942 to 1950. Several adults were collected by the senior author at Berthierville, Que., in 1950 on young sugar maple, *Acer saccharum* Marsh. In 1959, a number of these ambrosia beetles were collected from the same host on July 30 near Stayner, Ontario, and subsequently more than 40 collections of adults and immature stages were made from sugar maple regeneration in Lake Simcoe, Lake Huron, and Lake Erie districts.

The infestations, occurring under dense mature maple stands, vary from heavy near Mount Albert in the Lake Simcoe District to light in the western part of the Lake Huron District, with affected trees ranging from 10 inches to five feet in height. In some areas only a few trees are affected, whereas, in others almost all are killed. Occasionally, where the infestation is moderately heavy and uniform, there is an almost complete absence of regeneration more than two feet high, giving the stand the appearance of recent cattle grazing. Some trees that have escaped mortality show signs of attack at the root collar during previous years.

The adult beetle enters the stem near ground level and bores a tunnel completely within the wood just inside the cambium and usually spiralling around the stem, sometimes making two are more revolutions. As the beetle progresses, it excavates larval cradles at right angles to the main tunnel and along the grain of the wood. Stems from 3 to 10 mm. in diameter are successfully attacked, and attempts at entry were observed on stems as large as 20 mm. in diameter. Death of the plant is caused by the girdling effect of the adult tunnel or by stem breakage at the weakened root collar. Mortality in some infested stands during 1959 alone was as high as 90 plants per square yard (80% of regeneration). The beetles have also been found attacking regeneration of ironwood, *Ostrya virginiana* (Mill.) K. Koch, and white ash, *Fraxinus americana* L.—R. J. Finnegan, H. G. McPhee and W. Y. Watson.

PRAIRIE PROVINCES

A Predator of the Cottony Maple Scale.—An infestation of the cottony maple scale, *Pulvinaria innumerabilis* (Rathv.) was reported in the Greater Winnipeg area in the summer of 1958. On the basis of population counts the infestation was expected to continue in 1959 (Bi-Mon. Prog. Rpt. 15(3), 1959). Examination of 90 mature scales in early July showed 82 per cent had been attacked by a dipterous predator, the larvae of which had fed heavily on the emerging crawlers beneath the adult scales. By late July, from one to six (with an average of two) puparia were found within the cottony masses of infested scales. The adult flies emerged in early August and were identified by J. F. McAlpine, of the Entomology Research Institute, Ottawa, as *Leucopomyia pulvinariae* Mall.

It is impossible at this time to assess the effects of this heavy predation on the scale infestation. However, the lack of foliage wilting of Manitoba maple suggests effective control by the predator. Population counts will continue to the end of the infestation.—J. C. Melvin and R. M. Prentice.

Water Consumption of Two Species of Shrews.—It has been shown that water is an important factor in the population ecology of shrews. Hence, preliminary studies were undertaken to measure the water consumption of two species of shrews, *Sorex cinereus cinereus* Kerr and *Blarina brevicauda manitobensis* Anderson. The work was designed and carried out by T. Radcliffe with direction from the author.

It had been learned previously that conventional drinking tubes were not satisfactory for measuring the water consumption of shrews, because the tubes usually produced a drop of water at the tip, which was wasted when the animal began to drink. Water consumption as measured by drinking tubes was usually incredibly high, often amounting to over three times the values recorded herein. The possibility of measuring water consumption by weight was abandoned because a sufficiently accurate balance was not available. Hence, consumption was measured volumetrically. When open containers are presented to shrews, two difficulties arise: the animals climb into the container and waste water; they also deposit debris in the container. Therefore a guard must be placed over the container to allow only the nose of the animal to come in contact with the water. This necessitates a relatively constant water level so that the animal will not consume sufficient water to leave the level beyond its reach and die of thirst.

An apparatus was designed (Fig. 1) to fulfil the above conditions and to operate without disturbing the experimental animal. Essentially it consisted of two siphons, one (Fig. 1, A) from a large reservoir (Fig. 1, C) to the water dispenser (Fig. 1, D), and the other (Fig. 1, B) closed except to take the measurement from a graduate tube (Fig. 1, E) to the reservoir (Fig. 1, C). A 15 c.c. centrifuge tube was used as a water dispenser (Fig. 1, D) by fitting a glass retaining cage with a false bottom plywood floor (Fig. 1, F) and drilling a hole in the false floor to receive the dispenser. A siphon tube ran from the dispenser (Fig. 1, D) to a 500 c.c florence flask reservoir (Fig. 1, C) and was held in position in the dispenser by affixing it through a lid to the retaining cage that covered the portion of the cage over the dispenser. The lid served in addition to prevent the animal from climbing the siphon tube and escaping. A metal guard (Fig. 1, G) was attached to the siphon tube about one-quarter of an inch above the dispenser. The second siphon (Fig. 1, B), fitted with a stop cock, ran from the reservoir (Fig. 1. C) to a graduated centrifuge tube (Fig. 1, E). The stop cock remained closed except when a reading was being taken. A piece of glass tubing with a needle affixed to the end was inserted into the reservoir. The needle was set so that the point just came in contact with the water. The height of the reservoir was adjusted so that the water in the dispenser was maintained at approximately one-sixteenth of an inch from the top. As the animal consumes water from the dispenser, the levels in both the dispenser and reservoir are lowered and the needle breaks contact with the surface. Water consumption is recorded by removing the siphon to the graduate (Fig. 1, E), noting the reading, then siphoning from the graduate to the reservoir until the needle again makes contact with the water surface, removing the siphon from the graduate and noting the volume siphoned into the reservoir-dispenser system. By removing measured volumes of water from the dispenser with a hypodermic syringe, it was found that readings to the nearest 0.1 c.c., the smallest divisional unit on the graduate, were possible. To measure the evaporational loss from the dispenser, a second graduate 15 c.c. centrifuge tube with a tube and guard similar to that on the dispenser was attached to the wall of the retaining cage beyond the reach of the animal. This permitted direct and accurate measurements of evaporation.

Water consumption records were taken on one specimen of *S. cinereus* and two specimens of *B. brevicauda*. The average daily consumption was 5.6 and 7.3 c.c. respectively. Readings were taken twice daily, once at about 7 a.m. and again at about 7 p.m., C.S.T. The hourly rate of water consumption for the three animals tested is shown in Fig. 2. This indicates a much higher consumption during the hours of darkness, which is in agreement with the general activity patterns of these shrews. The total water consumption, particularly for *S. cinereus* is remarkably high, amounting to almost the same weight as food consumption.

These results suggest that shrews may spend as much time in search of water as they do in searching for food. In order to gain further insight into this aspect a 24-hour watch was placed on each species. *S. cinereus* made 247 trips to the water dispenser during this period and consumed water for about 6 seconds each trip. In the same time interval the specimen made 223 trips to the food tray and fed for about 30 seconds each trip. *B. brevicauda* made 109 trips to the water dispenser and drank for about 9 seconds. This specimen made 166 trips to the food tray and fed for about 30 seconds. The animals usually went directly to the water dispenser, but seldom took a direct route to the feeding tray. Hence the amounts of water and foods consumed did not appear to reflect the times spent

in searching. The data do suggest that available water plays a very important role in the habitat tolerances of these two species.—C. H. Buckner.

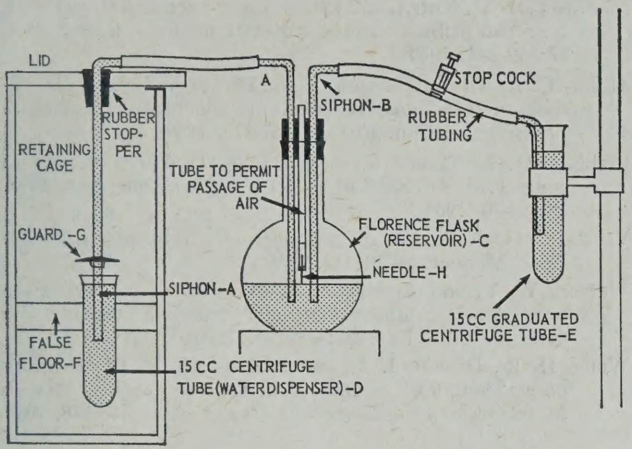

Fig. 1.—Apparatus used to measure the water consumption of shrews.

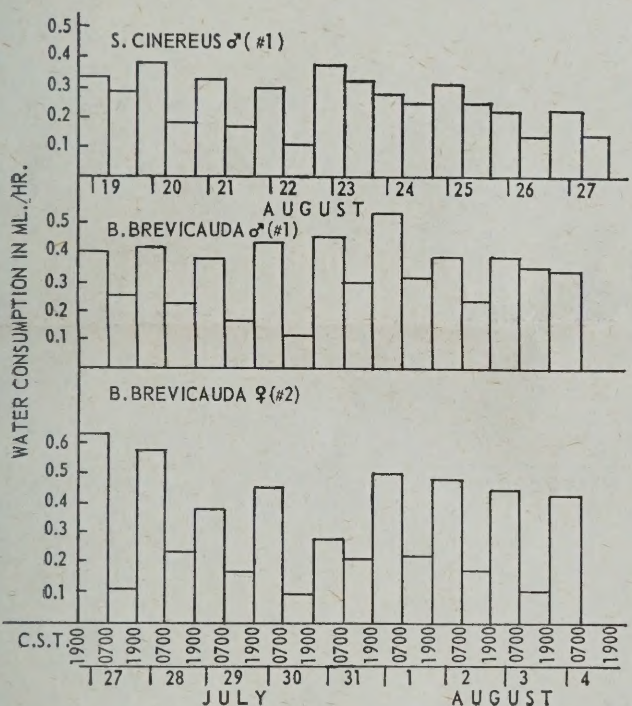

Fig. 2.—Hourly rate of water consumption for two species of shrews.

BRITISH COLUMBIA

Forced Attacks by the Ambrosia Beetle, Trypodendron. —It is well known that the ambrosia beetle, *Trypodendron*, shows considerable selectivity with respect to logs it attacks. This selectivity appears to be related both to time of year when logs are felled and duration of the period between cutting and removal of logs, but there are often large differences in attack density on logs cut at the same time.

In order to learn something of the activity and success of *Trypodendron* when it has no choice of material to attack, a series of observations were made on beetles confined on various Douglas fir and western hemlock logs. Tests of this type were carried out in 1957, 1958, and 1959 and involved several hundred beetles. The test insects were captured in flight or while crawling on logs, or were taken from forest litter (duff) before spring flight. They were confined by aluminum rings, about 1 inch deep and 1½ inches in diameter, held firmly against the bark and covered with cloth at the open end. The suitability of each group of beetles used was indicated by control tests in which a number of pairs were confined to autumn or winter-felled logs attacked under natural conditions a short time before the tests. All forced attacks were started during natural flight and attack periods in April or May. The results of this work are summarized briefly here.

Pairs of beetles confined on suitable logs usually initiated and carried out an apparently normal attack.

Of 70 pairs of beetles confined to logs felled in March or April, almost half stopped excavation at the sapwood surface or before reaching it and none penetrated more than ⅛ inch into the sapwood. In the 1959 tests, 23 out of 25 and none out of 50 pairs were successful in their attack on control and spring-felled logs, respectively. In the field it is often noted that spring-felled logs remain free from *Trypodendron* attack during the spring flight. It appears that the sapwood of such logs has a repellent effect or lacks a stimulus for continued burrowing activity by the beetles.

None of the 40 males confined without females on suitable logs made a noticeable excavation into bark or sapwood.

Half of the 30 females dug from galleries in which they were starting to lay eggs and confined at a new location on suitable logs failed to start another gallery. The rest made short unbranched galleries except for two that constructed short branches and laid eggs.

Of a total of 196 females confined singly on logs, 146 excavated galleries and 78 of these laid eggs, many of which produced larvae and pupae. In 1958, for example, 116 females were confined on suitable logs: 30 escaped or died within two weeks without starting to burrow, 36 constructed galleries but did not lay eggs, and 50 (43 per cent) made galleries and laid one or more eggs, many of which developed. Of the 30 control pairs for this particular series 57 per cent produced eggs, with an average of 17 per gallery, as compared with an average of 9.5 eggs per single egg-laying female. A sample of 100 females from the same source was determined by dissection to consist of 48 virgin and 52 mated beetles. It is not possible from the above results to confirm or rule out the possibility of parthenogenetic egg production but the data are consistent with the view that unmated females excavate galleries but do not lay eggs. Finally, the tests showed conclusively that males are not necessary for the actual process of gallery excavation, egg-laying and brood care.—J. A. Chapman.

An anobiid, Ernobius punctulatus Lec. in Cones of Douglas Fir.—Species of *Ernobius* have been reported in cones of several species of trees (Keen, F. P. Cone and seed insects of western forest trees. U.S.D.A. Tech. Bull. 1169, 1958). Larvae and adults of the beetle feed only in mature or dead cones so are not important in seed production. However, cones in storage for some time prior to seed extraction may suffer damage.

E. punctulatus has been observed feeding in mature Douglas-fir cones taken at Colwood, B.C. Cones from the 1958 crop were examined during the spring and summer of 1959. Thirty-one per cent of 411 cones examined were infested with the insect; the number per cone ranged from one to 24. Once established. the insect feeds on scale and axis material and when many are present the cone eventually disintegrates.

Data in Tables I and II show that larvae are present during the summer, and adults commence emerging in June. Cones were not examined over more than one year to see if larvae persist for several years. A closely related species, *E. pallitarsis* Fall, was reported by Keen to emerge over a period of three years.—A. F. Hedlin and W. G. Stickland.

TABLE I

Observations in 1959 on development of *Ernobius punctulatus* Lec. in 1958 Douglas-fir cones Colwood, B. C.

Month	No. of insects			
	Larvae	Pupae	Adults	Emerged*
April	109	0	0	0
May	47	0	0	0
June	96	4	6	0
July	16	4	6	0
August	10	1	1	0
September	2	0	0	40

* Adults vacated cones.

TABLE II

Development of 38 *E. punctulatus* larvae reared in individual gelatin capsules, 1959

Date	Larvae		Pupae	Adults
	Living	Dead		
May 28	38	0	0	0
June 2	38	0	0	0
July 1	23	5	9	1
July 17	17	5	2	8
August 25	3	4	5	7
September 18	3	0	0	5

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